Space Weather Technical Forecast

Issued on Thursday, 04 April 2024 at 13:03 Local

This technical forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

Space Weather Forecast Headline: Solar activity expected to be Low or Very Low. Chance of G1 Minor Storm intervals on 04 Apr, declining 05 Apr due to coronal hole high speed stream. Chance of Active fluence by 07 Apr.

Analysis of Space Weather Activity over past 24 hours
Solar Activity: Solar activity has been Very Low with no significant flare activity. There are four sunspot regions on the visible disc, with all these benign and inactive.

No Earth-directed CMEs were observed on available imagery.

Solar Wind / Geomagnetic Activity: Solar wind speeds, measured at ACE, initially decreased from 450km/s to 350km/s. Speeds then increased again from around 04/0300UTC to reach 450km/s by the end of the period, under the influence of a coronal hole high speed stream from coronal holes 16 and 17. Density started below average, but reached around average levels from around 04/0300UTC as the Earth encountered a modest CIR ahead of the coronal hole high speed stream. Total magnetic field strength was generally weak, but reached moderate levels from around 04/0300UTC due to the coronal hole high speed stream connection, reaching a peak of 11nT at 04/0736 UTC. The north-south component Bz was near neutral for much of the period, but reached a consistent negative peak of around 8nT from 04/0933UTC. Phi angle started mainly positive (towards the Sun) but became negative from 04/0500UTC. Geomagnetic activity was Quiet to Unsettled.

Energetic Particles / Solar Radiation: High energy proton flux (greater than 10MeV) observed at GOES-18 was at background levels. High energy electron flux (greater than 2MeV) observed at GOES16 was at background levels. The associated 24-hour fluence remained well below Active, with a value of 3.11e6 integrated pfu at 04/0000UTC.

Four-Day Space Weather Forecast Summary
Solar Activity: Low to Very Low activity is expected, with a slight chance of isolated M-flares given the unknown risk from over the east limb, with this increasing slightly through the period.

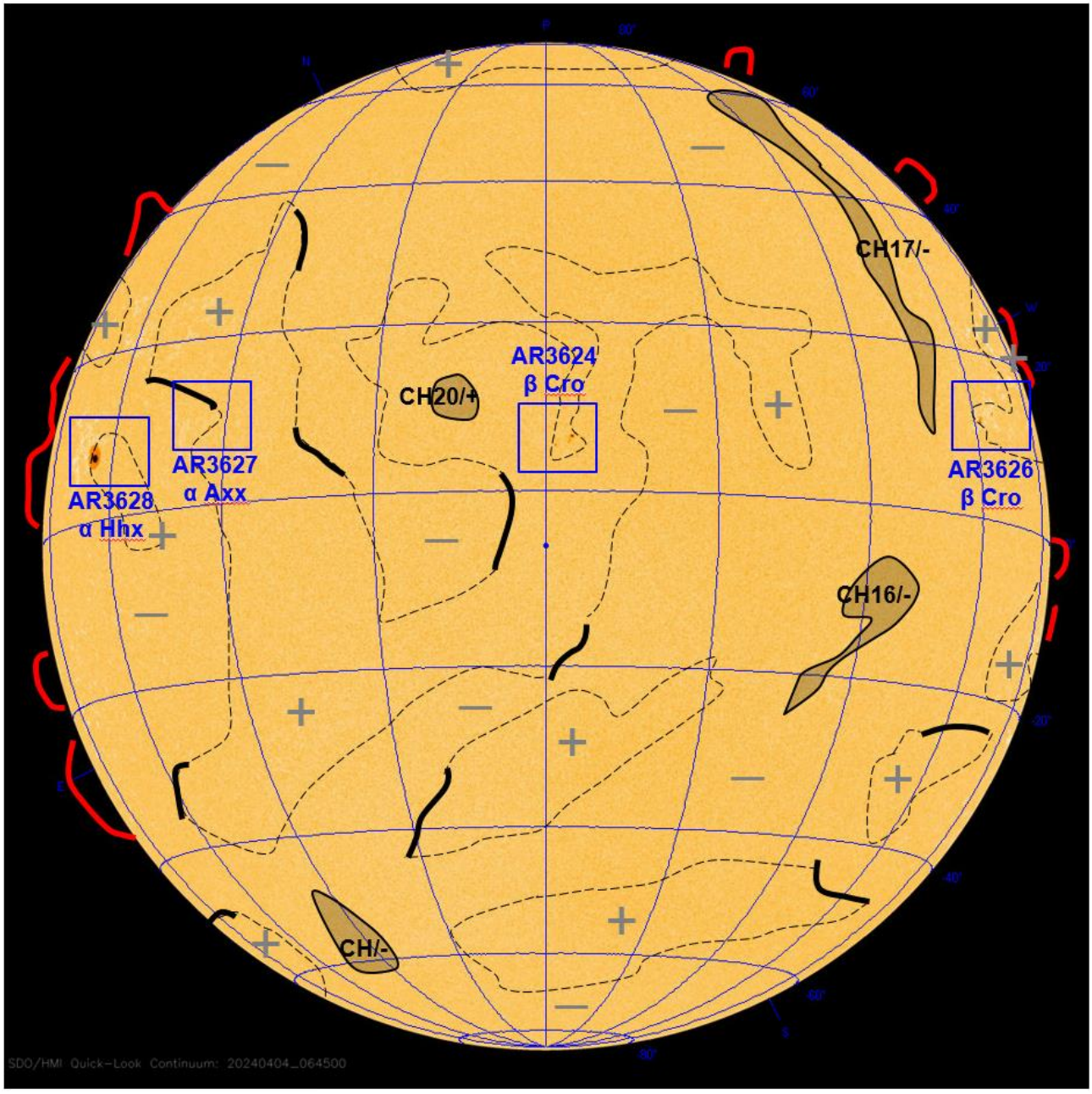
Solar Wind / Geomagnetic Activity: There are no Earth-directed CMEs currently expected. Solar wind speeds are currently close to 450km/s due to a high speed stream from coronal holes 16 and 17. Speeds are expected to continue at between 400-500m/s through 04 Apr and into 05 Apr. a decrease is then expected from 06 Apr. Geomagnetic activity is expected to be mainly Quiet to Unsettled through 04 and 05 Apr, with a chance of Active or G1/Minor Storm intervals. Activity is then forecast to gradually decrease towards Quiet levels.

Energetic Particles / Solar Radiation: High energy proton flux as observed by GOES18, is expected to remain near background levels. High energy electron flux is forecast to persist at background levels initially, potentially rising due to enhancements from the coronal hole high speed stream. There is a chance of fluence rising above the Active (1e8 integrated pfu) threshold by 07 Apr.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Figure 1. Solar Analysis Valid 04/0800UTC.



Key: Filament ___ , Prominence ___ , Magnetic Field Line - - - , Polarity +/-, Coronal Holes: Grey shaded area CHxx +/-, Sunspot groups 25xx - Mt Wilson α-β-βγ-βγδ and Zurich-McIntosh Axx etc.

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Geomagnetic Storms:

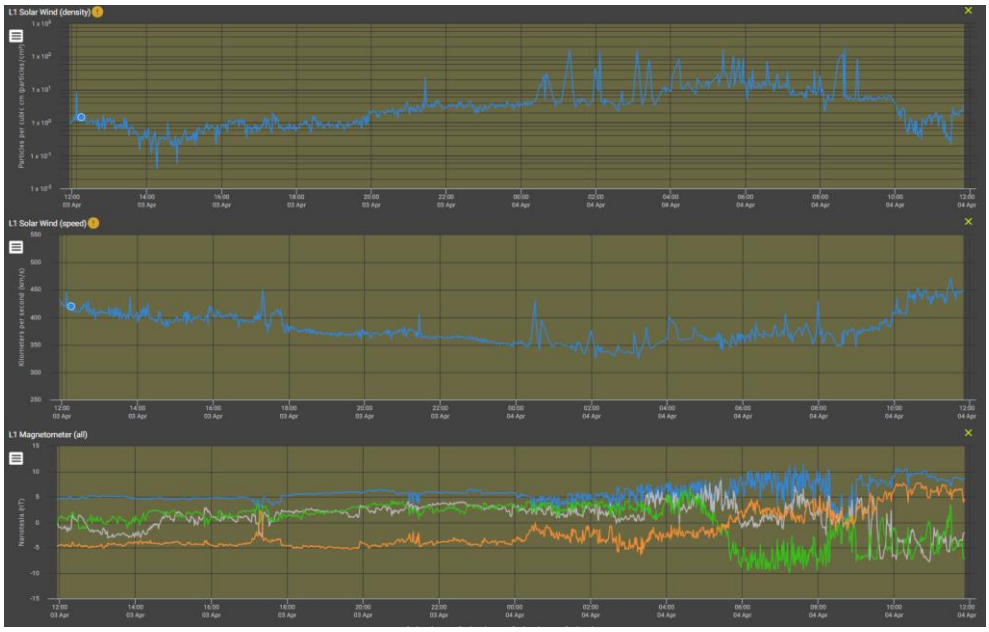
There are no CMEs expected during the forecast period.

Solar winds speeds are elevated at 450km/s as the Earth moves under the influence of a coronal hole high speed stream from a combination of coronal holes 16 and 17. These are recurrent features which produced speeds of 400-500km/s on the last rotation, and given they appear similar on this rotation, comparable speeds are expected. Speeds are then expected to decline from 06 Apr onwards. No further significant coronal holes are then expected to connect with Earth through the period.

Geomagnetic activity is forecast to be Quiet to Unsettled on 04 Apr, with a chance of reaching Active to G1/Minor Storm levels. There is then a declining risk on 05 Apr, gradually returning to Quiet conditions by the end of the period.

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	40	20	5	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Figure 2: ACE solar wind parameters for the last 24 hours



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

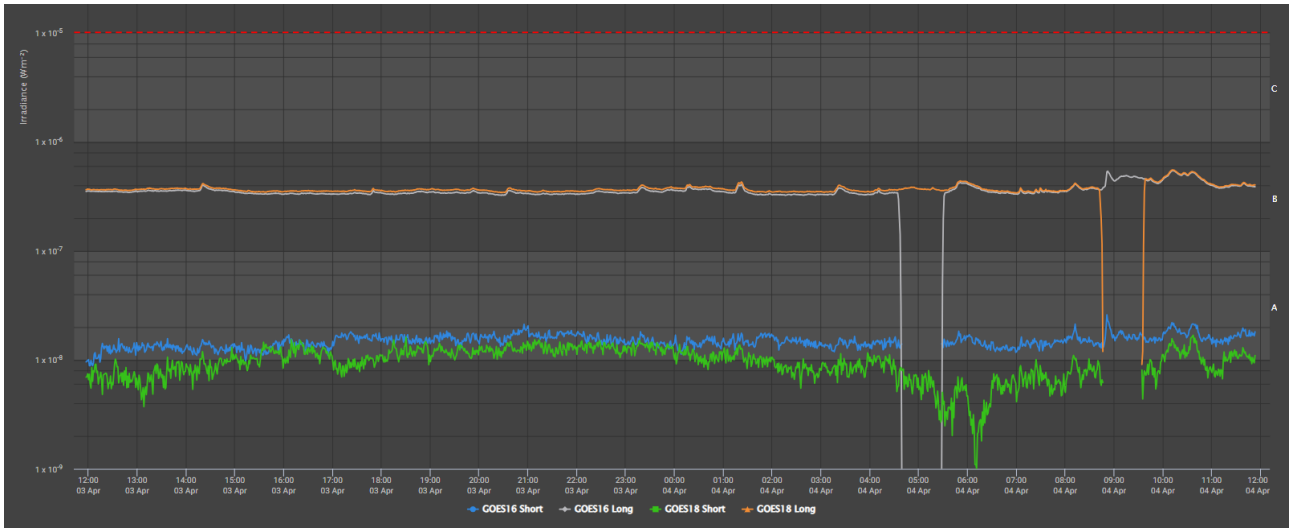
© Crown Copyright 2024. All Rights Reserved.

Radio Blackouts - X-Ray Flares:

There are four sunspot regions on the visible disc, AR3624 had weakened and faded, but appears to be strengthening again as it approaches centre disc, but the remaining regions all appear relatively simple. There is the potential for some regions to rotate across from the farside later in the period, although it is difficult to quantify this risk at present, with a low risk of M-class flaring maintained through the period.

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	5	10	10	15
Very Active	R3 to R5 X Class	No	1	1	1	1

Figure 3: GOES-16 X-ray flux



Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.

Solar Radiation Storms - (High Energy Protons):

High energy proton flux observed by GOES-18 is now at background levels and expected to remain so, with none of the visible active regions currently expected to bring a risk of significant proton rich flares. Any new regions rotating onto the east limb may be more active but are expected to remain in the less favourable eastern hemisphere throughout the period.

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	1	1	1	1
Very Active	**≥ S3 ***	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

High Energy Electrons Event (≥ 2MeV):

High energy electron flux is likely to increase from background to increasingly moderate levels during 04 and 05 Apr as the solar wind high speed stream persists. There is then a risk of the high threshold being exceeded later in the period as the high speed stream fades.

24 electron fluence is expected to remain well below the Active (1e8 integrated pfu) threshold on 04 and 05 Apr. A rising trend is then possible, increasing towards the Active threshold by the end of the forecast period.

GEO Electron Environment Probability (Exceedance)	Level (cm^{-2} sr^{-1} day^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ 2 MeV ≥ $1x10^8$**	No	1	5	20	30
Very Active	**≥ 2 MeV ≥ $1x10^9$**	No	1	1	1	1

Issued by Met Office Space Weather Advisor, Tel: +44 (0) 330 135 4254 Email: moswoc@metoffice.gov.uk

© Crown Copyright 2024. All Rights Reserved.